REMARKS

This Preliminary Amendment cancels, without prejudice, originally-filed claims 1-23 in underlying PCT Application No. PCT/DE00/00537. New claims 24-49 have been added merely to conform the claims to U.S. Patent and Trademark Office practice and standards, and do not add new matter to the application. Furthermore, the addition of these new claims in no way addresses any issues of patentability, and the new claims are provided to place the application in condition for allowance.

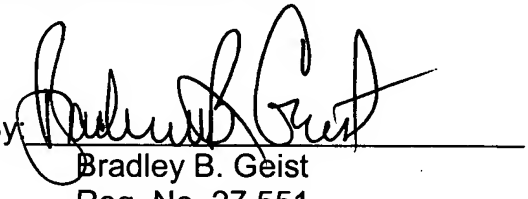
The amendment to the abstract and the substitute specification are provided to correct grammatical and syntactical errors and otherwise to conform the specification and abstract of the above-identified application to the U.S. Patent and Trademark Office practice. No new matter has been introduced to the application.

The amendments to the "Abstract" and "Claims" are reflected in the attached "Version With Marked Changes Made."

Favorable consideration on the merits is respectfully requested.

Respectfully submitted,

Dated: December 14, 2001

By 

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Version With Marked Changes Made

We claim:

~~1. A seagoing high-speed ship having an electrical steering propeller which has a polyphase electric motor which is mounted under the stern of the ship via a shaft which can rotate and preferably has two parts in a gondola-like housing, and can be supplied with electrical drive power via a slipring arrangement, and can be rotated via drive motors, characterized in that the steering propeller is mounted in the stern of the ship via a flat collar bearing (7) in the vicinity of the outer skin (6), in particular above the waterline, with the slipring arrangement (8) being accommodated in the upper part (3) of the shaft (2, 3) at the level of the annular bearing (7), and with the drive motors for the rotary movement (9) being physically small and being arranged at least partially in the interior of the collar bearing (4), in order to achieve a small installed arrangement for the steering propeller.~~

~~2.~~ 25. The ~~seagoing high speed~~ ship ~~as claimed in~~according to claim ~~1, characterized in that~~24, wherein the electrical steering propeller is mounted below the waterline in the stern of the ship in a gondola-like housing.

~~3.~~ 26. The ~~seagoing high speed~~ ship ~~as claimed in~~according to claim ~~1 or 2, characterized in that~~24, wherein the collar bearing ~~(7)~~ is connected to the ~~structural parts of the~~ ship~~'~~'s stern via an intermediate covering ~~part (10), possibly with~~.

27. The ship according to claim 26, wherein the intermediate covering has an annular configuration~~. 4. The seagoing high speed ship as claimed in claim 3, characterized in that the intermediate covering part (10)~~ and is connected to the ~~structural parts of the~~ ship~~'~~'s stern via a box structure ~~(11)~~.

~~5.~~ 28. The ~~seagoing high speed~~ ship ~~as claimed in~~according to claim ~~3, characterized in that~~26, wherein the intermediate covering ~~part (10), in particular having~~has an annular ~~shape,~~configuration and is connected to ~~the~~a double bottom ~~(20)~~ of the ship.

~~6.~~ 29. The ~~seagoing high speed~~ ship ~~as claimed in~~according to claim ~~3, 4 or 5, characterized in that~~26, wherein the intermediate covering ~~part (10)~~ is ~~arranged~~located immediately under ~~the~~a lowermost cargo deck in the ~~stern area, that is to say, in roro ships, immediately under the car deck (5).~~ship's stern area.

~~7. The seagoing high speed ship as claimed in claim 1, 2, 3, 4, 5 or 6, characterized in that the shaft (2, 3) is mounted under a steering propeller sealing cover (4) in the ship's stern.~~

~~8. The seagoing high speed ship as claimed in claim 7, characterized in that the sealing cover (4) is a component of the car deck (5) when the ship is in the form of a roro ship.~~

~~9. The seagoing high speed ship as claimed in claim 7 or 8, characterized in that the sealing cover (4) has access openings to individual appliances, such as the slipring arrangement (8), the drive motors (9) for the rotary movement, and other essential functional elements of the steering propeller.~~

30. The ship according to claim 24, wherein the shaft is mounted under a sealing cover in the ship's stern.

31. The ship as according to claim 30, wherein the sealing cover is a component of a lower most cargo deck in the ship's stern.

32. The ship according to claim 30, wherein the sealing cover has openings to access components of the steering propeller including the slipring, drive motors and other essential elements.

~~10. The seagoing high speed~~33. The ship ~~as claimed in one or more of the preceding claims, characterized in that~~according to claim 24, wherein the drive motors ~~(9) for the rotary movement~~ are ~~in the form of~~ flat radial piston hydraulic motors.

~~11. The seagoing high speed~~34. The ship ~~as claimed in one or more of the preceding claims, characterized in that~~according to claim 24, wherein the collar bearing ~~(7)~~ has a toothed rim for the rotary movement on ~~the~~a rotatable

ring ~~(35)~~ of the collar bearing ~~(7)~~, and ~~the~~a stationary ring is connected~~, preferably directly,~~ to a ~~ship~~ structural part ~~(31)~~.of the ship.

~~12. The seagoing high speed ship as claimed in one or more of the preceding claims, characterized in that~~35. The ship according to claim 34, wherein the motors ~~(33) for the rotary movement~~ are arranged under the collar bearing ~~(7)~~ in the shaft upper part ~~(36), being~~and held via supports ~~(37)~~ and ~~engaging~~engaged via pinions ~~(34)~~ in ~~the~~a rotatable ring ~~(35)~~ of the collar bearing ~~(7)~~.

~~13. The seagoing high speed~~36. The ship ~~as claimed in one or more of the preceding claims, characterized in that~~according to claim 33, wherein hydraulic pumps for driving the motors ~~(33) are arranged in the shaft (36), in particular in the form of power packs~~.are located in the shaft.

~~14. The seagoing high speed ship as claimed in one or more of the preceding claims, characterized in that the electrical power for the slipring arrangement is supplied via cables which lead from the side to the slipring arrangement, in order to achieve a flat design.~~

~~15. The seagoing high speed ship as claimed in one or more of the preceding claims, characterized in that the slipring arrangement has a connecting element (21) for connection of cables coming from the side.~~

~~16. The seagoing high speed ship as claimed in one or more of the preceding claims, characterized in that the electrical steering propeller has at least one fan in the upper part (3) of the~~

~~shaft, in particular to avoid heat accumulations in the shaft (2, 3) in the region of the auxiliary drives or the like.~~

37. The ship according to claim 24, wherein electrical power for the slipring is supplied via a cable which is routed to the slipring arrangement so as to enable the sealing cover to be smooth.

38. The ship according to claim 37, wherein the slipring has a connecting element for connecting the cable.

39. The ship according to claim 24, wherein the electrical steering propeller further comprises at least one fan located in the upper part of the shaft.

~~17. The seagoing high speed~~40. The ship ~~as claimed in one or more of the preceding claims, characterized in that the upper~~according to claim 24, wherein the diameter of the shaft upper part ~~(3)~~ is at least equal to~~or greater than the~~ a winding length of the electric motor~~(1)~~.

~~18. The seagoing high speed~~41. The ship ~~as claimed in one or more of the preceding claims, characterized in that~~according to claim 24, wherein the upper part ~~(3)~~ of the ~~steering propeller~~ shaft~~(2, 3)~~ is sealed in a fire-resistant manner from the ship's lower most deck ~~located above it~~area.

~~19. The seagoing high speed~~42. The ship ~~as claimed in one or more of the preceding claims, characterized in that~~according to claim 24, wherein the sliprings~~for~~ supplying power to and monitoring the motor are at least partially in the form of concentric sliprings~~in the slipring arrangement (8).~~.

~~20. An seagoing high speed ship, in particular as claimed in one or more of the preceding claims, characterized in that the sliprings for supplying power to the electric motor are two phase~~

~~or three phase sliprings, and in that~~43. A ship according to claim 24, wherein the sliprings are two-phase or three-phase sliprings and further comprising a junction for a motor winding system having more than two or three phases ~~is made~~located behind the slipring~~ arrangement, in particular via power semiconductors in the form of a local converter, which is arranged in the shaft (2, 3).~~.

~~21. The seagoing high speed ship as claimed in one or more of the preceding claims, characterized in that the separating point between the upper part (3) and the lower part (2) of the shaft is located approximately at~~44.The ship according to claim 24, wherein the upper part of the shaft interfaces the lower part of the shaft at approximately the same level as the outer skin ~~(6) of the ship, and the steering propeller is preferably arranged so far aft in the stern that the joint element is located entirely above the waterline.~~of the ship.

~~22. The seagoing high speed ship as claimed in one or more of the preceding claims, characterized in that the separating point~~45. The ship according to claim 44, wherein the interface between the upper part ~~(3)~~ and the lower part ~~(2) of the shaft is arranged above the ship'~~of the shaft is located above the ship's outer skin~~ in a shaft well in the stern of the ship.~~.

~~23. The seagoing high speed ship as claimed in one or more of the preceding claims, characterized in that the length of the ship (2, 3) is dimensioned, and the motor shaft of the steering propeller toward the stern is arranged in a rising manner, such that the flow produced by it approximately follows~~46. The ship

according to claim 24, wherein the shaft of the steering propeller is arranged so that the propeller's flow follows approximately the stern profile of the ship.

47. The ship according to claim 24, wherein the flat collar bearing is located above the ship's waterline.

48. The ship according to claim 36, wherein the hydraulic pumps are~~(33) are arranged in the shaft (36), in particular~~ in the form of power packs.

49. The ship according to claim 43, wherein the junction is made via power semi conductors in the form of a local converted located in the shaft.

ABSTRACT OF THE DISCLOSURE

An electrical steering propeller for a seagoing high-speed ship having~~1. A seagoing high-speed ship having an electrical steering propeller which has~~ a polyphase electric motor which is mounted under the stern of the ship via a shaft which can rotate and preferably has two parts in a gondola-like housing, and can be supplied with electrical drive power via a slipring arrangement, and can be rotated via drive motors, ~~characterized in that~~wherein the steering propeller is mounted in the stern of the ship via a flat collar bearing (7) in the vicinity of the outer skin (6), in particular above the waterline, with the slipring arrangement (8) being accommodated in the upper part (3) of the shaft (~~2, 3~~2,3) at the level of the annular bearing (7), and with the drive motors for the rotary movement (9) being physically small and being arranged at least partially in the interior of the collar bearing (4)~~, in order to achieve a small installed arrangement for the steering propeller.~~.

A34737-PCT-USA (071308.0258)
PATNET

BAKER BOTTS L.L.P.

30 ROCKEFELLER PLAZA

NEW YORK, NEW YORK 10112

TO ALL WHOM IT MAY CONCERN:

Be it known that WE, Manfred Heer and Wolfgang Rzadki, citizens of Germany, residing in Düngenheim and Glinde, respectively, whose post office addresses are Bachstraße 7, 56761 Düngenheim, Germany and Groothegen 4 E, 21509 Glinde, Germany respectively, have invented an improvement in:~~Deseription~~

~~Electrical steering propeller having a small installed height~~

~~The invention relates to an electrical steering propeller having a small installed height for a seagoing high speed ship, having a polyphase electric motor which is mounted under the stern of the ship via a shaft which can rotate and preferably has two parts in a gondola like housing, and can be supplied with electrical drive power via a slipring arrangement, and can be rotated via drive motors.~~

~~The prospectus from Siemens and Schottel, entitled "The SSP Propulsor", No. 159U559 04982, April 1998, discloses a steering propeller which can be rotated, in which the sliprings for transmission of the electrical drive power are arranged, in the same way as the hydraulic drive motors for the rotary movement and their hydraulic pumps, in a drive machine room (Propulsor 500 m) above the steering propeller. The cables are supplied to the sliprings from above.~~

~~The object of the invention is to refine the known drive such that, in particular for roro ships, more space is obtained in the stern of the ship. In roro ships, by way of example, it is intended to be possible to construct a continuous internal car deck without the stern door for the car deck, and the car deck itself, having to be raised. In this case, as before, adequate capabilities for repair and maintenance should be provided. In this case, it is intended to be possible to design the conditions downstream from the stern to optimize the drag, taking account of the flow conditions resulting from the use of steering propellers.~~

~~The object is achieved in that the steering propeller is mounted in the stern of the ship via a flat collar bearing in the vicinity of the outer skin, in particular above the waterline, with the slipring arrangement being~~

~~accommodated in the upper part of the shaft at the level of the annular bearing, and with the drive motors for the rotary movement being physically small and being arranged at least partially in the interior of the collar bearing. This results in the small installed arrangement, desired according to the invention, for the electrical steering propeller. Admittedly, at first, it appears to be impossible to accommodate the sliprings and the drive motors for the rotary movement etc. in the upper part of the shaft with its "rotating bearing" constriction, so that it is still possible to produce a passage downward. However, the invention is feasible by optimizing the sizes of all the parts and by largely dispensing with horizontally running struts. This makes it possible to move the drive motors for the rotary movement to the area under the slipring arrangement.~~

~~The flat collar bearing can be arranged both above the waterline and, alternatively, below the waterline. In the case of an arrangement below the waterline, it is advantageously kept at an increased pressure. The arrangement disclosed in Canadian Patent Specification 1.311.657, with the shaft entering the ship below the waterline and an internal extension of the shaft to above the waterline, is considerably less advantageous. This can result in seawater entering the interior of the bearing.~~

~~If the shaft it mounted in a large diameter collar bearing above the waterline, with the bearing diameter being approximately equal to or greater than the winding length of the electric motor, this results, especially when, as advantageously proposed, the collar bearing also has a large internal diameter, in the upper part of the shaft of the steering propeller being so roomy that the slipring arrangement, whose size has been optimized, and the rotating motors can be accommodated completely inside it. It is thus highly advantageously possible to dispense with a separate machine room above the steering propeller, and installed height can be saved. The collar bearing can be arranged directly under the car deck.~~

~~In this case, it is advantageous for the shaft to have a shaft upper part which is arranged above the ship's waterline, and which is largely arranged recessed in the ship's stern. This very advantageously results in all the major parts of the rotating drive being arranged in a protected manner outside the water flowing around the hull. If the height of the shaft lower part in this case corresponds approximately to the gondola diameter, this results in a very physically small drive overall, since the high speed double propeller intended for use makes it possible to choose relatively small propeller diameters.~~

~~This advantageously allows a drive to be produced for shallow-draft ships, configured according to the invention.~~

ELECTRICAL STEERING PROPELLER HAVING A SMALL INSTALLED HEIGHT

of which the following is a

SPECIFICATION

FIELD OF THE INVENTION

[0001] The present invention relates to a seagoing high-speed ship having an electrical steering propeller which has a polyphase electric motor which is mounted under the stern of the ship via a shaft which can rotate and preferably has two parts in a gondola-like housing, and can be supplied with electrical drive power via a slipring arrangement which can be rotated via drive motors.

BACKGROUND OF THE INVENTION

[0002] CA 1,311,637 A discloses ~~a corresponding~~an electrical steering propeller~~, whose shaft is tubular. The slipring body is located above the shaft, inside the ship.~~ having a tubular shaft inside the ship with a slipring body located above the shaft. The prospectus from Siemens and Schottel, entitled ~~"The SSP Propulsor", No.~~ "The SSP Propulsor", No. 159U559 04982, April 1998, also discloses a steering propeller which can be rotated, in which the sliprings for transmission of the electrical drive power are arranged~~, in~~ the same way as the hydraulic drive motors for the rotary movement ~~and their hydraulic pumps,~~ with their hydraulic pumps located in a drive machine room (Propulsor 500 m)

above the steering propeller. ~~The cables~~ Cables located from above are supplied to the sliprings ~~from above.~~.

SUMMARY OF THE INVENTION

[0003] The object of the present invention is to refine known drives such that ~~The object of the invention is to refine the known drive such that, in particular for roro ships,~~ more space is obtained in the stern of the ship. ~~In roro ships, by way of example, it is intended to be possible~~ This is particularly important in Roro-ships where it is desirable to construct a continuous internal car deck without the stern door for the car deck, ~~and~~or the car deck itself, having to be raised. ~~In this case, as before,~~ It is also important to retain adequate capabilities for repair and maintenance ~~should be~~. It is a further object to design ~~provided. In this case, it is intended to be possible to design the~~ conditions downstream from the stern to minimize drag, taking into account ~~optimize the drag, taking account of~~ the flow conditions resulting from the use of steering propellers.

[0004] These objects are achieved by mounting the steering propeller ~~The object is achieved in that the steering propeller is mounted~~ in the stern of the ship via a flat collar bearing in the vicinity of the outer skin, ~~in particular above the waterline, with the slipring arrangement being~~and preferably above the waterline. The slipring arrangement is accommodated in the upper part of the shaft at the level of the annular bearing, and with the drive motors for the rotary movement being physically small and ~~being~~ arranged at least partially in the

interior of the collar bearing~~,~~ in order to achieve a small installed arrangement for the ~~steering propeller. This results in the small installed arrangement, desired according to the invention, for the~~ electrical steering propeller. ~~Admittedly, at first, it appears~~ While at first blush it may appear to be impossible to accommodate the sliprings and the drive motors ~~for the rotary movement etc.~~ in the upper part of the shaft ~~with its "rotating bearing" constriction, so that it is still possible to produce a passage downward. However, the invention is~~due to the construction of its "rotating bearing" and still provide a downward passage, the invention is made feasible by optimizing the sizes of all the parts and by largely dispensing with horizontally running struts. This makes it possible to move the drive motors ~~for the rotary movement~~ to the area under the slipring arrangement.

[0005] The flat collar bearing can be arranged both above the waterline and~~,~~ ~~alternatively, below the waterline.~~ below the waterline. In the case of an arrangement below the waterline, it ~~is advantageously kept at an increased pressure. The~~ is advantageous to maintain an increased pressure. However, the arrangement disclosed in CA ~~1,311,657A, with the shaft entering the ship below the waterline and an internal extension of the shaft to above the waterline, is considerably less advantageous. This can result in seawater entering the interior of the bearing.~~ 1,311,657A, where the shaft enters the ship below the waterline with an internal extension of the shaft above the

waterline, is considerably less advantageous since seawater can enter the interior of the bearing.

[0006] Where the shaft is mounted in a large-diameter collar bearing above the waterline, and the bearing diameter is approximately equal to or greater than the winding length of the electric motor, this results in the upper part of the shaft of the steering propeller being sufficiently spacious that the slipring arrangement and the rotating motors can be accommodated completely inside the shaft. This is especially true when the collar bearing also has a large internal diameter. Accordingly, it is possible to dispense with a separate machine room above the steering propeller with a concomitant saving in installed height. The collar bearing can be arranged directly under the car deck.

[0007] ~~A further refinement of the invention provides for the drive motors for the rotary movement~~The present invention further provides for the drive motors to be in the form of flat hydraulic radial piston motors. This results in a particularly advantageous configuration of the rotating motors~~, with~~ since they have small dimensions and a large torque.

[0008] The present invention advantageously provides for the possibility of connecting the shaft to the ship~~'~~'s hull via an intermediate covering part immediately under the lowermost cargo deck in the stern~~area~~, for example the car deck in the case of ~~roro~~Roro-ships. Such ~~a small~~an intermediate covering part, which may also be in the form of an annular disk, advantageously results in the ~~capability~~ability to install the electrical steering propeller such that it is both ~~particularly~~ stable and ~~is~~ physically small. The intermediate covering part can be arranged in the stern area

both via mounting elements~~, for example~~ such as boxes, and directly~~, for example~~ by fitting it on ~~the~~to a double bottom. It is particularly advantageous in the case of Roro-ships~~Particularly in the case of roro ships, it is in this case advantageous~~ if the shaft is mounted under a steering propeller sealing cover in the ship~~'~~'s stern, with the sealing ~~cover advantageously~~cover being a component of the car deck ~~when the ship is in the form of a roro ship.~~. This results in particularly good utilization of the physical height available in the stern of the ship, which allows vehicles to be driven directly onto the inner car deck via the stern door. This allows the car deck to be used over the full length of the ship, thus resulting in ~~previously impossibly good~~significantly improved space utilization for the main car deck. Full utilization of the weather-deck area is likewise ensured, in which case the capstan drives etc. can advantageously be arranged under the weather~~-~~ deck in order to enlarge the usable area.

~~Particularly in the case of roro ships, it is in this case advantageous if the shaft is mounted under a steering propeller sealing cover in the ship's stern, with the sealing cover advantageously being a component of the car deck when the ship is in the form of a roro ship. This results in particularly good utilization of the physical height available in the stern of the ship, which allows vehicles to be driven directly onto the inner car deck via the stern door. This allows the car deck to be used over the full length of the ship, thus resulting in previously impossibly good space utilization for the main car deck. Full utilization of the weather deck area is likewise ensured, in which case the capstan drives etc. can~~

~~advantageously be arranged under the weather deck in order to enlarge the usable area.~~

[0009] A ~~refinement~~preferred embodiment of the present invention ~~provides~~is ~~for~~where the sealing cover ~~to have~~is provided with access openings to individual ~~appliances~~components in the steering propeller, for example, to the slipring arrangement, to the drive motors ~~for the rotary movement~~, and to other essential functional elements. ~~Thus, advantageously, there is no~~ This eliminates the need to remove the sealing cover in the car deck ~~for~~while performing servicing work and minor repairs, since the ~~corresponding~~ ~~appliances~~components can ~~instead~~ be accessed via ~~access~~the openings ~~like manholes~~.

[0010] ~~The~~Further, the present invention ~~in this case~~ advantageously provides for the upper part of the steering propeller to be sealed in a fire-resistant manner from the lowermost deck in the stern area. This ~~advantageously~~ makes it possible to comply with the safety requirements for ~~roro~~Roro or ~~ropax~~Ropax ships~~,~~ without needing to modify the advantageous configuration~~,~~ of the electrical steering propeller which only requires a minimal installed height~~, of the electrical steering propeller~~.

[0011]

~~The invention furthermore provides for the electrical steering propeller that the sliprings for supplying power to and monitoring the motor are at least partially in the form of concentric sliprings. This results in a small physical shape for the power supply and signal transmission~~

~~components. For electric motors having more than 3 phases, for example for 6 phase or 12 phase electric motors, as well as for split electric motors, the invention in this case provides in particular for the power supply sliprings to be designed to have only 3 phases and for a junction to a motor winding system having more than 3 phases~~

[0012] The present ~~The~~ invention furthermore provides ~~for~~ the electrical steering propeller ~~that the~~with sliprings for supplying power to and monitoring the motor which are at least partially in the form of concentric sliprings. This results in a small physical shape for ~~the~~ power supply and signal transmission components. ~~For electric~~ For electrical motors having more than ~~3 phases, for example for~~ three phases, for example 6-phase or 12-phase electric motors, as well as for split electric motors, the present invention provides~~motors, the invention in this case provides in particular~~ for the power supply sliprings to be designed to have only ~~3 phases~~three phases, and for a junction to a motor winding system having more than ~~3 phases~~ three phases to be made behind the slipring arrangement via power semiconductors, which form a local converter ~~and are~~ arranged in the shaft. It is thus also possible to supply power to polyphase or split electric motors with a physically small, relatively ~~simple~~simply slipring body. This considerably simplifies the construction~~,~~ and considerably reduces the physical height of the slipring arrangement. Polyphase winding systems can thus be supplied with electrical power in a controlled, advantageous manner. The power ~~semiconductors~~semi-conductors can ~~highly advantageously by well~~be cooled via heat dissipation elements which are connected to the shaft casing~~, which is well cooled~~ by the seawater flowing around it.

[0013] The cables for power transmission are advantageously routed from the side to the slipring arrangement of the shaft. ~~This admittedly~~ While this requires a separate connecting element on the slipring arrangement~~.~~, ~~The~~the additional costs incurred as a result of this are~~, however,~~ more than compensated for by the gain in space. The connecting element can advantageously run between the vehicle lanes on the car deck of a ~~roro~~ Roro-ship. This therefore does not detract from the small installed height of the steering propeller.

As a result of the arrangement of the drives for the rotary movement and for the slipring body ~~etc.~~ in the shaft upper part, ~~these must be [lacuna]~~they are close to the auxiliary appliances in the shaft, for example the bilge pumps and oil pumps, etc. If required, power semiconductors are also located in this area, since the lower shaft part is designed to be narrow to assist the flow ~~(~~and also ~~acting~~act as a rudder~~)~~. ~~It~~ Further, since it is impossible to prevent heat accumulations from being formed~~. This is overcome by arranging~~, at least one fan can be arranged in the upper part of the shaft, which allows air to circulate in the ~~shaft upper part, and if necessary also allows air to be interchanged.~~shaft upper part, and if necessary, also allows air to be interchanged.

~~The invention furthermore advantageously provides for the transition from the upper part to the lower part of the shaft to be located at the same level as the outer skin of the ship, preferably entirely above the waterline. The flange between the upper part and lower part~~

[0014] ~~of the ship~~In a further preferred embodiment of the present invention,~~The invention furthermore advantageously provides for~~ the transition from the upper part to the lower part of the shaft ~~to~~may be located at the same level as the outer skin of the ship, preferably entirely above the waterline. The flange between the upper part and lower part of the shaft can thus be removed from the flow around the

hull, thus ~~also~~ allowing the shaft to be replaced with the electric motor for repairs~~,~~ without any need for the ship to be docked. For reliably "dry" replacement, it is sufficient for the ship to be trimmed bow-down.

[0015] ~~A~~In yet a further ~~refinement~~preferred embodiment of the invention ~~provides for~~, the motor shaft of the steering propeller ~~to be~~is inclined at an angle matched approximately to the stern profile of the ship. This results in a ~~particularly advantageous~~ downstream flow in the stern area of the ship~~,~~ which ~~highly advantageously~~ makes use of the flow~~,~~ accelerated by the propellers~~,~~ to reduce the stern drag of the ship. The steering propeller according to the present invention can ~~then~~thus be arranged right at the stern without causing any disadvantageous effects on the flow. This advantageous configuration results in the maximum amount of space being gained. Thus, overall, not only does the use of the steering propeller according to the invention, with a small installed height, result in better utilization of the space available in the stern area of the ship's hull, but there is also no deterioration in the flow in the stern area in comparison to conventional steering propellers arranged more deeply under the ship.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The invention ~~will be~~is explained below in ~~more~~greater detail with reference to the drawings ~~from~~in which~~, in the same way as from the dependent claims, further details that are essential to the invention will become evident. In detail~~:

Figure 1~~ shows a~~ is a side view of the steering propeller according to the invention ~~with~~illustrating its space-saving installation~~ that occupies very little space, from the side,~~;

Figure 2~~ shows~~ is a rearview of a double steering propeller arrangement in the stern area of the ship~~, from astern,~~;

Figure 3~~ shows~~ is an overhead view of the double steering propeller arrangement illustrated in Figure ~~2, from above,~~2;

Figure 4~~ shows~~ is a side view of the ~~shaft~~ upper part~~,~~ of the shaft with the cable supply at the side~~, from the side.~~;

Figure 5~~ shows~~ is a top view of the ~~shaft~~ upper part of the shaft as shown in Figure ~~4, from above,~~4; and

Figure 6~~ shows~~ is a view of a compressed section through a collar bearing arrangement ~~with~~having a particularly small installed height.

~~Figure 1 shows a roro or ropax application with a very small installed height between the outer skin 6 and the car deck 5. All the components of the electrical steering propeller, with the exception of the shaft 2 and the motor part 1, are fitted into this small installed height.~~

~~The following measures are taken, by way of example, in order to achieve the fit described above:~~

DETAILED DESCRIPTION OF THE DRAWINGS

[0017] ~~A small~~Figure 1 shows a Roro or Ropax ship application having a ~~Figure 1 shows a roro or ropax application with a very~~ small installed height between the ship's outer skin 6 and the car deck 5. All the components of the electrical steering propeller, with the exception of the shaft 2 and the motor part 1, are ~~fitted into~~arranged in this small installed height. By way of example, this is achieved by an intermediate covering part 10, ~~possibly~~which can even be in the form of an annular disk~~, is~~ inserted between the outer skin 6 of the ship and the car deck 5, ~~with~~and which has the steering propeller ~~being~~ mounted ~~on it~~thereon. The stationary parts of the collar bearing 7 are arranged above the intermediate covering part 10. A cover 4, which is ~~advantageously~~preferably sealed in a fire-resistant manner, is installed in the car deck 5, through which the steering propeller unit located underneath is accessible. Various small covers (~~not~~now shown) which provide easy access to the major functional parts of the steering propeller are inserted into ~~this large~~the larger cover ~~4.~~. The slipring arrangement 8 and the rotating motors 9 are ~~very largely~~ located in the interior of the collar bearing 7 and in the shaft upper part 3. The collar bearing 7, together with the intermediate covering part 10 (which is physically ~~particularly~~ small ~~here)~~, is ~~advantageously~~ arranged in the stern of the ship, via a box structure 11.

[0018] The ~~large~~ cover 4 ~~can be~~is supported directly or indirectly on the intermediate covering part 10, so that the space under the cover 4 has a ~~very~~ small physical height, and the overall installed height is thus optimally low. ~~The~~ A bending-resistant power supply cable can advantageously be routed to the slipring arrangement 8

from the side, so that the cover 4 is smooth and can be mounted directly above the slipring arrangement. 8.

[0019]

~~supply cable can advantageously be routed to the slipring arrangement from the side, so that the cover 4 is smooth and can be mounted directly above the slipring arrangement.~~

[0020] The steering propeller itself is advantageously inclined such that is its drive axis runs at a rising angle to the rear. This improves the downstream flow, even if the stern is short. In this case, the separating flange between the upper part of the steering propeller 3 and the shaft may be located approximately at the same level as the outer skin so that, if the steering propeller is arranged relatively far to the stern, and it is physically short, no flange parts need be arranged in the flow around the hull.

[0021] The cover 4 is advantageously provided with a fire-resistant seal so that, in the event of a fire in this part of the drive system, there is no risk to the car decks located above it. Conversely, the operation of the drive system is not adversely affected by a fire on the car deck, and the ship can still be propelled.

The low height between the intermediate covering part 10 and the cover 4 is also achieved by using flat radial piston hydraulic motors for the azimuth drive. The medium voltage for the main motor, the low voltage for the auxiliary systems, and the signals for control/regulation of the motor are transmitted via the electrical slipring arrangement 8, which is located in the upper part 3 of the shaft and, in particular, has a number of parts. The steering propeller itself can be rotated endlessly through 360°. The sliprings of the slipring arrangement 8 are arranged ~~especially~~ concentrically with respect to one another, with the signal transmission antennas (which are not shown in ~~any greater detail) advantageously being located on the~~

~~outside.~~any greater detail) preferably~~any greater detail) advantageously~~ being located on the outside.

[0022] Figure 2 shows~~ the~~ two steering propeller units~~, annotated~~ 18 and 19. In this embodiment, the intermediate covering part is ~~advantageously~~ located directly on the ship's double bottom 17. The column bearing is mounted, for example, via struts, and the rotating motors are arranged in the same way as the slipring bodies~~, according to the invention,~~ in the intermediate space 16 underneath the car deck 15. This results in a small physical height for the installation of the steering propellers, which are arranged well astern.

[0023] As ~~can be seen from~~shown in Figure 3, the auxiliary appliances 12 ~~for~~of the azimuth drive, for example, the hydraulic pumps and their motors, are ~~likewise~~also located in the intermediate space underneath the car deck. The two steering propellers 13 and 14 are supplied with rotation power via short hydraulic lines. ~~According to the invention, this also advantageously~~ This makes it possible to dispense with a separate machine room above the steering propellers 13 and 14.

[0024] ~~In~~ Figure ~~4, 21 denotes~~4 shows a cable connection 21 which is routed at the side~~,~~; an upper cover 23 ~~denotes the upper cover~~ on the slipring arrangement~~,~~; and upper parts of the drives 22 ~~denotes the upper parts of the drives~~ for the rotary movement. Figure 4 ~~shows a particularly good example of~~illustrates the small installed height which can be achieved in accordance with the present invention.

[0025] ~~In~~ Figure ~~5, 24 denotes the connecting part~~5 illustrates the connecting part 24 of the cable connection ~~29, 27 denotes~~29; an entry 27 into the shaft~~, and 26 denotes~~; a spare cross section~~.~~ 26; a fan 28 ~~denotes a fan,~~; and a drive 30 ~~a drive~~ for the rotary movement. Since ~~the~~these components ~~shown all also~~ have connecting lines, terminals, mounting elements, flanges etc., it is ~~obvious~~apparent that space optimization ~~was required here, necessitating detailed considerations.~~has been achieved in accordance with the present invention.

~~In Figure 6, which shows a physically small collar bearing according to the invention, illustrated partially in the form of a section, 31 denotes the~~

[0026] ~~ship~~Figure 6 shows a partial section of a ~~In Figure 6, which shows a~~ physically small collar bearing according to the ~~invention, illustrated partially in the form of a section, 31 denotes the~~ present invention. The structural part of the ship which forms the base ~~for~~of the collar bearing~~.~~ is identified by the reference number 31. This may be, for example, an intermediate covering part, a part of the double bottom or an annular part on the outer skin of the ship. Reference number 32 denotes, for example, the car deck in the case of a ~~roro~~Roro ship, or the deckhead on the car deck. Reference number 33 denotes a motor for the rotary drive, which is mounted on a support 37. Reference number 34 denotes a drive pinion for the rotating ring 35 of the collar bearing. Finally, reference number 36 denotes the shaft of the steering propeller~~,~~ which is connected directly to the rotating part of the collar bearing. The connecting elements between the individual parts, such as flanges with

bolts, welded seams, etc., are not shown, since Figure 6 is an outline illustration of a particularly physically small bearing arrangement. In this case, the drive motors 33 for the rotary movement are even arranged completely inside the shaft.

~~In the example~~As shown in Figures 2 and 3, the flow freely reaches the steering propellers, respectively 18, 19 and 13, ~~14, 18 and 19 freely. This~~14 which is important especially for particularly low-vibration operation~~, although flow~~. Flow guide bodies can also be arranged upstream of the steering propellers, ~~being~~ designed ~~in particular~~ in the form of hooks, with the hook tip at the same level as the shafts of the steering propellers. This results in the ship moving straight ahead ~~particularly well, a possible improvement in~~; improves the propulsion efficiency~~,~~; and ~~a possible improvement in~~improves the downstream flow behavior of the ship's stern. However, in this case, the tendency of the drive system to vibrate must be optimized with respect to the advantages achieved, so that ~~these~~the flow guide bodies are more appropriate for ~~roro~~Roro ferries, and are less suitable for ~~ropax~~Ropax ferries or for cruise ships. ~~The optimization is in each case dependent on the ship type, speed and field of use.~~ With appropriate ~~optimization, all the ship types can advantageously be equipped with flow guide bodies~~ optimization, all the ship types can advantageously be equipped with flow guide bodies arranged in front of the steering propellers and having a roughly droplet-shaped cross section. The flow guide bodies admittedly increase the wetted surface area, but their advantages for the ship behavior, ~~the downstream drag and the~~downstream, drag, and propulsion efficiency may, however, more than compensate for this disadvantage. It is particularly advantageous to combine them ~~(not shown)~~ with the physically small, possibly short, steering propellers according to the present invention, since this allows the additional wetted area to be kept small.

~~arranged in front of the steering propellers and having a roughly droplet-shaped cross section. The flow guide bodies admittedly increase the wetted surface area, but their advantages for the ship behavior, the downstream drag and the propulsion efficiency may, however, more than compensate for this disadvantage. It is particularly~~

~~advantageous to combine them (not shown) with the physically small, possibly short, steering propellers according to the invention, since this allows the additional wetted area to be kept small.~~

~~Patent Claims~~

~~1. An electrical steering propeller for a seagoing high-speed ship having a polyphase electric motor which is mounted under the stern of the ship via a shaft which can rotate and preferably has two parts in a gondola-like housing, and can be supplied with electrical drive power via a slipring arrangement, and can be rotated via drive motors, characterized in that the steering propeller is mounted in the stern of the ship via a flat collar bearing (7) in the vicinity of the outer skin (6), in particular above the waterline, with the slipring arrangement (8) being accommodated in the upper part (3) of the shaft (2, 3) at the level of the annular bearing (7), and with the drive motors for the rotary movement (9) being physically small and being arranged at least partially in the interior of the collar bearing (4).~~

~~2. The electrical steering propeller as claimed in claim 1, characterized in that said propeller is mounted below the waterline in the stern of the ship.~~

~~3. The electrical steering propeller as claimed in claim 1 or 2, characterized in that the collar bearing (7) is connected to the structural parts of the ship's stern via an intermediate covering part (10), possibly with an annular configuration.~~

~~4. The electrical steering propeller as claimed in claim 3, characterized in that the intermediate covering part (10)~~

~~is connected to the structural parts of the ship's stern via a box structure (11).~~

~~5. The electrical steering propeller as claimed in claim 3, characterized in that the intermediate covering part (10), in particular having an annular shape, is connected to the double bottom (20) of the ship.~~

~~6. The electrical steering propeller as claimed in claim 3, 4 or 5, characterized in that the intermediate covering part (10) is arranged immediately under the lowermost cargo deck in the stern area, that is to say, in roro ships, immediately under the car deck (5).~~

~~7. The electrical steering propeller as claimed in claim 1, 2, 3, 4, 5 or 6, characterized in that the shaft (2, 3) is mounted under a steering propeller sealing cover (4) in the ship's stern.~~

~~8. The electrical steering propeller as claimed in claim 7, characterized in that the sealing cover (4) is a component of the car deck (5) when the ship is in the form of a roro ship.~~

~~9. The electrical steering propeller as claimed in claim 7 or 8, characterized in that the sealing cover (4) has access openings to individual appliances, such as the slipring arrangement (8), the drive motors (9) for the rotary movement, and other essential functional elements of the steering propeller.~~

~~10. The electrical steering propeller as claimed in one or more of the preceding claims, characterized in that the drive motors (9) for the rotary movement are in the form of flat radial piston hydraulic motors.~~

~~11. The electrical steering propeller as claimed in one or more of the preceding claims, characterized in that the collar bearing (7) has a toothed rim for the rotary movement on the rotatable ring (35) of the collar bearing (7), and the stationary ring is connected, preferably directly, to a ship structural part (31).~~

~~12. The electrical steering propeller as claimed in one or more of the preceding claims, characterized in that the motors (33) for the rotary movement are arranged under the collar bearing (7) in the shaft upper part (36), being held via supports (37) and engaging via pinions (34) in the rotatable ring (35) of the collar bearing (7).~~

~~13. The electrical steering propeller as claimed in one or more of the preceding claims, characterized in that hydraulic pumps for driving the motors (33) are arranged in the shaft (36), in particular in the form of power packs.~~

~~14. The electrical steering propeller as claimed in one or more of the preceding claims, characterized in that the electrical power for the slipring arrangement is supplied via cables which lead from the side to the slipring arrangement, in order to achieve a flat design.~~

~~15. The electrical steering propeller as claimed in one or more of the preceding claims, characterized in that the slipring arrangement has a connecting element (21) for connection of cables coming from the side.~~

~~16. The electrical steering propeller as claimed in one or more of the preceding claims, characterized in that said propeller has at least one fan in the upper part (3) of the shaft, in particular to avoid heat accumulations in the~~

~~shaft (2, 3) in the region of the auxiliary drives or the like.~~

~~17. The electrical steering propeller as claimed in one or more of the preceding claims, characterized in that the upper diameter of the shaft upper part (3) is equal to or greater than the winding length of the electric motor (1).~~

~~18. The electrical steering propeller as claimed in one or more of the preceding claims, characterized in that the upper part (3) of the steering propeller shaft~~

~~(2, 3) is sealed in a fire-resistant manner from the deck located above it.~~

~~19. The electrical steering propeller as claimed in one or more of the preceding claims, characterized in that the sliprings for supplying power to and monitoring the motor are at least partially in the form of concentric sliprings in the slipring arrangement (8).~~

~~20. An electrical steering propeller, in particular as claimed in one or more of the preceding claims, characterized in that the sliprings for supplying power to the electric motor are two phase or three phase sliprings, and in that a junction for a motor winding system having more than two or three phases is made behind the slipring arrangement, in particular via power semiconductors in the form of a local converter, which is arranged in the shaft (2, 3).~~

~~21. The electrical steering propeller as claimed in one or more of the preceding claims, characterized in that the separating point between the upper part (3) and the lower part (2) of the shaft is located approximately at the same~~

~~level as the outer skin (6) of the ship, and the steering propeller is preferably arranged so far aft in the stern that the joint element is located entirely above the waterline.~~

~~22. The electrical steering propeller as claimed in one or more of the preceding claims, characterized in that the separating point between the upper part (3) and the lower part (2) of the shaft is arranged above the ship's outer skin in a shaft well in the stern of the ship.~~

~~23. The electrical steering propeller as claimed in one or more of the preceding claims, characterized in that the length of the ship (2, 3) is dimensioned, and the motor shaft of the steering propeller toward the stern is arranged~~

~~in a rising manner, such that the flow produced by it approximately follows the stern profile of the ship.~~

~~Abstract~~

~~Electrical steering propeller having a small installed height~~

~~An electrical steering propeller for a seagoing high-speed ship having a polyphase electric motor which is mounted under the stern of the ship via a shaft which can rotate and preferably has two parts in a gondola like housing, and can be supplied with electrical drive power via a slipring arrangement, and can be rotated via drive motors, wherein the steering propeller is mounted in the stern of the ship via a flat collar bearing (7) in the vicinity of the outer skin (6), in particular above the waterline, with the slipring arrangement (8) being accommodated in the upper part (3) of the shaft (2, 3) at the level of the annular~~

~~bearing (7), and with the drive motors for the rotary movement (9) being physically small and being arranged at least partially in the interior of the collar bearing (4).~~

~~Figure 1~~

~~Patent Claims~~

WE CLAIM:

~~1.~~24. ~~A seagoing high speed~~A ship having an electrical steering propeller ~~which [lacuna] a polyphase electric motor which is mounted under the stern of the ship via a shaft which can rotate and preferably has two parts in a gondola like housing, and can be supplied with electrical drive power via a slipring arrangement, and can be rotated via drive motors, characterized in that the steering propeller is mounted in the stern of the ship via a flat collar bearing (7) in the vicinity of the outer skin (6), in particular above the waterline, with the slipring arrangement (8) being accommodated in the upper part (3) of the shaft (2, 3) at the level of the annular bearing (7), and with the drive motors for the rotary movement (9) being physically small and being arranged at least partially in the interior of the collar bearing (4), in order to achieve a small installed arrangement for the steering propeller.~~comprising a polyphase electric motor mounted in a housing under the ship's stern via a shaft having upper and lower parts and which is rotated by a drive motor, further comprising a slipring arrangement for supplying electrical drive power, a flat collar bearing for mounting the steering propeller and located proximally to the ship's outer skin, wherein the slipring is located in the upper part of the shaft proximal to the collar bearing and the drive motors

are located at least partially in the interior of the collar bearing, thereby achieving a compact installed arrangement of the aforesaid components of the steering propeller.

~~2. The seagoing high-speed ship as claimed in claim 1, characterized in that the electrical steering propeller is mounted below the waterline in the stern of the ship.~~

~~3. The seagoing high-speed ship as claimed in claim 1 or 2, characterized in that the collar bearing (7) is connected to the structural parts of the ship's stern via an intermediate covering part (10), possibly with an annular configuration.~~

~~4. The seagoing high-speed ship as claimed in claim 3, characterized in that the intermediate covering part (10) is connected to the structural parts of the ship's stern via a box structure (11).~~

~~5. The seagoing high-speed ship as claimed in claim 3, characterized in that the intermediate covering part (10), in particular having an annular shape, is connected to the double bottom (20) of the ship.~~

~~6. The seagoing high-speed ship as claimed in claim 3, 4 or 5, characterized in that the intermediate covering part (10) is arranged immediately under the lowermost cargo deck in the stern area, that is to say, in roro ships, immediately under the car deck (5).~~

~~7. The seagoing high-speed ship as claimed in claim 1, 2, 3, 4, 5 or 6, characterized in that the shaft (2, 3) is mounted under a steering propeller sealing cover (4) in the ship's stern.~~

~~8. The seagoing high speed ship as claimed in claim 7, characterized in that the sealing cover (4) is a component of the car deck (5) when the ship is in the form of a roro ship.~~

~~9. The seagoing high speed ship as claimed in claim 7 or 8, characterized in that the sealing cover (4) has access openings to individual appliances, such as the slipring arrangement (8), the drive motors (9) for the rotary movement, and other essential functional elements of the steering propeller.~~

~~10. The seagoing high speed ship as claimed in one or more of the preceding claims, characterized in that the drive motors (9) for the rotary movement are in the form of flat radial piston hydraulic motors.~~

~~11. The seagoing high speed ship as claimed in one or more of the preceding claims, characterized in that the collar bearing (7) has a toothed rim for the rotary movement on the rotatable ring (35) of the collar bearing (7), and the stationary ring is connected, preferably directly, to a ship structural part (31).12. The seagoing high speed ship as claimed in one or more of the preceding claims, characterized in that the motors (33) for the rotary movement are arranged under the collar bearing (7) in the shaft upper part (36), being held via supports (37) and engaging via pinions (34) in the rotatable ring (35) of the collar bearing (7).~~

~~13. The seagoing high speed ship as claimed in one or more of the preceding claims, characterized in that hydraulic pumps for driving the motors (33) are arranged in the shaft (36), in particular in the form of power packs.~~

~~14. The seagoing high speed ship as claimed in one or more of the preceding claims, characterized in that the electrical power for the slipring arrangement is supplied via cables which lead from the side to the slipring arrangement, in order to achieve a flat design.~~

~~15. The seagoing high speed ship as claimed in one or more of the preceding claims, characterized in that the slipring arrangement has a connecting element (21) for connection of cables coming from the side.~~

~~16. The seagoing high speed ship as claimed in one or more of the preceding claims, characterized in that the electrical steering propeller has at least one fan in the upper part (3) of the shaft, in particular to avoid heat accumulations in the shaft (2, 3) in the region of the auxiliary drives or the like.~~

~~17. The seagoing high speed ship as claimed in one or more of the preceding claims, characterized in that the upper diameter of the shaft upper part (3) is equal to or greater than the winding length of the electric motor (1).~~
~~18. The seagoing high speed ship as claimed in one or more of the preceding claims, characterized in that the upper part (3) of the steering propeller shaft (2, 3) is sealed in a fire resistant manner from the deck located above it.~~

~~19. The seagoing high speed ship as claimed in one or more of the preceding claims, characterized in that the sliprings for supplying power to and monitoring the motor are at least partially in the form of concentric sliprings in the slipring arrangement (8).~~

~~20. A seagoing high speed ship, in particular as claimed in one or more of the preceding claims, characterized in that the sliprings for supplying power to the electric motor are~~

~~two phase or three phase sliprings, and in that a junction for a motor winding system having more than two or three phases is arranged behind the slipring arrangement, in particular via power semiconductors in the form of a local converter, which is arranged in the shaft (2, 3).~~

~~21. The seagoing high speed ship as claimed in one or more of the preceding claims, characterized in that the separating point between the upper part (3) and the lower part (2) of the shaft is located approximately at the same level as the outer skin (6) of the ship, and the steering propeller is preferably arranged so far aft in the stern that the joint element is located entirely above the waterline.~~

~~22. The seagoing high speed ship as claimed in one or more of the preceding claims, characterized in that the separating point between the upper part (3) and the lower part (2) of the shaft is arranged above the ship's outer skin in a shaft well in the stern of the ship.23. The seagoing high speed ship as claimed in one or more of the preceding claims, characterized in that the length of the ship (2, 3) is dimensioned, and the motor shaft of the steering propeller toward the stern is arranged in a rising manner, such that the flow produced by it approximately follows the stern profile of the ship.~~
~~Description~~

~~Electrical steering propeller having a small installed height~~

~~The invention relates to a seagoing high speed ship having an electrical steering propeller which has a polyphase electric motor which is mounted under the stern of the ship via a shaft which can rotate and preferably has two parts in a gondola like housing, and can be supplied with~~

~~electrical drive power via a slipring arrangement, and can be rotated via drive motors.~~

~~CA 1,311,637 A discloses a corresponding electrical steering propeller, whose shaft is tubular. The slipring body is located above the shaft, inside the ship.~~

~~The prospectus from Siemens and Schottel, entitled "The SSP Propulsor", No. 159U559 04982, April 1998, also discloses a steering propeller which can be rotated, in which the sliprings for transmission of the electrical drive power are arranged, in the same way as the hydraulic drive motors for the rotary movement and their hydraulic pumps, in a drive machine room (Propulsor 500 m) above the steering propeller. The cables are supplied to the sliprings from above.~~

~~The object of the invention is to refine the known drive such that, in particular for roro ships, more space is obtained in the stern of the ship. In roro ships, by way of example, it is intended to be possible to construct a continuous internal car deck without the stern door for the car deck, and the car deck itself, having to be raised. In this case, as before, adequate capabilities for repair and maintenance should beprovided. In this case, it is intended to be possible to design the conditions downstream from the stern to~~
~~optimize the drag, taking account of the flow conditions resulting from the use of steering propellers.~~

~~The object is achieved in that the steering propeller is mounted in the stern of the ship via a flat collar bearing in the vicinity of the outer skin, in particular above the waterline, with the slipring arrangement being accommodated in the upper part of the shaft at the level of the annular bearing, and with the drive motors for the rotary movement~~

~~being physically small and being arranged at least partially in the interior of the collar bearing, in order to achieve a small installed arrangement for the steering propeller. This results in the small installed arrangement, desired according to the invention, for the electrical steering propeller. Admittedly, at first, it appears to be impossible to accommodate the sliprings and the drive motors for the rotary movement etc. in the upper part of the shaft with its "rotating bearing" constriction, so that it is still possible to produce a passage downward. However, the invention is feasible by optimizing the sizes of all the parts and by largely dispensing with horizontally running struts. This makes it possible to move the drive motors for the rotary movement to the area under the slipring arrangement.~~

~~The flat collar bearing can be arranged both above the waterline and, alternatively, below the waterline. In the case of an arrangement below the waterline, it is advantageously kept at an increased pressure. The arrangement disclosed in CA 1,311,657A, with the shaft entering the ship below the waterline and an internal extension of the shaft to above the waterline, is considerably less advantageous. This can result in seawater entering the interior of the bearing.~~

~~If the shaft it mounted in a large-diameter collar bearing above the waterline, with the bearing diameter being approximately equal to or greater than the winding length of the electric motor, this results, especially when, as advantageously proposed, the collar bearing also has a large internal diameter, in the upper part of the shaft of the steering propeller being so roomy that the slipring arrangement, whose size has been optimized, and the rotating motors can be accommodated completely inside it. It is thus highly advantageously possible to dispense with a separate machine room above the steering propeller, and~~

~~installed height can be saved. The collar bearing can be arranged directly under the car deck.~~

~~A further refinement of the invention provides for the drive motors for the rotary movement to be in the form of flat hydraulic radial piston motors. This results in a particularly advantageous configuration of the rotating motors, with small dimensions and a large torque.~~

~~The invention advantageously provides for the possibility of connecting the shaft to the ship's hull via an intermediate covering part immediately under the lowermost cargo deck in the stern area, for example the car deck in the case of roro ships. Such a small intermediate covering part, which may also be in the form of an annular disk, advantageously results in the capability to install the electrical steering propeller such that it is both particularly stable and is physically small. The intermediate covering part can be arranged in the stern area both via mounting elements, for example boxes, and directly, for example by fitting it on the double bottom.~~

~~Particularly in the case of roro ships, it is in this case advantageous if the shaft is mounted under a steering propeller sealing cover in the ship's stern, with the sealing cover advantageously being a component of the car deck when the ship is in the form of a roro ship. This results in particularly good utilization of the physical height available in the stern of the~~
~~Patent Claims~~